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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/811,742	03/06/1997	HONGYONG ZHANG	0756-1641	1505

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EXAMINER	
NGUYEN, KHIEM D	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 07/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action	Application No.	Applicant(s)	
	08/811,742	ZHANG ET AL.	
	Examiner	Art Unit	
	Scott A Brairton	2823	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 17 July 2002 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY [check either a) or b)]

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1. ☐ A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.

2. ☐ The proposed amendment(s) will not be entered because:

   (a) ☐ they raise new issues that would require further consideration and/or search (see NOTE below);

   (b) ☐ they raise the issue of new matter (see Note below);

   (c) ☐ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

   (d) ☐ they present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____.

3. ☐ Applicant's reply has overcome the following rejection(s): _____.

4. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

5. ☒ The a)☐ affidavit, b)☐ exhibit, or c)☒ request for reconsideration has been considered but does NOT place the application in condition for allowance because: *see attached office action*.

6. ☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.

7. ☐ For purposes of Appeal, the proposed amendment(s) a)☐ will not be entered or b)☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

   The status of the claim(s) is (or will be) as follows:

   Claim(s) allowed: _____.

   Claim(s) objected to: _____.

   Claim(s) rejected: *5-12, 16, 19, 26-48, 67-84*.

   Claim(s) withdrawn from consideration: _____.

8. ☐ The proposed drawing correction filed on _____ is a)☐ approved or b)☐ disapproved by the Examiner.

9. ☐ Note the attached Information Disclosure Statement(s)(PTO-1449) Paper No(s). _____.

10. ☐ Other: _____

DETAILED ACTION

Response to Amendment After Final

Applicant's arguments filed July 17th, 2002 have been fully considered but they are not persuasive.

Status of the Amendment After Final Rejection

The amendment after final rejection filed July 17th, 2001 raises no new issues, and therefore has been entered into the record

Status of the Pending Claims After Final Rejection

The finally rejected claims are 5-12, 16, 19, 26-48, and 67-84.

Status of Pending Rejections

Claims 5-8, 11-12, 16, 19, 27-48 and 67-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP `915) in combination with Liu et al. (US `826) and in combination with Kuznetsov (Inst. Phys. Conf.) and in combination with Kumomi.

Oka discloses a method of manufacturing a semiconductor device for the formation of an active matrix type electro-optical display having a driving circuit portion and display portion comprising the steps of forming an amorphous Silicon layer on a glass substrate by PECVD (pg. 6, translation), selectively forming a Ni layer (pg. 14, translation) of a thickness of 100-200 Angstroms on a-Si layer in seed regions outside the regions slated to become TFT active regions, such that Ni does not diffuse into said active regions by abnormal diffusion. Therefore, the Ni is introduced into the seed

regions by solid source diffusion. The method further discloses thermally heating the Ni at 450 C° (pg. 6, translation) such that the Ni catalyst would diffuse through the semiconductor film forming crystal nuclei near the interface between the metal layer and the a-Si layer (pg. 7, translation). After diffusion of the catalyst through the semiconductor film, the metal layer is removed to prevent abnormal diffusion (i.e. diffusion into the active layer of the TFT as defined pg. 7 of translation). The method also includes formation of semiconductor islands (fig. 2b) consisting of a first region and the formation of a semiconductor island consisting of a second region. Examiner previous official notice was not adequately contested, therefore, it is taken as admitted prior art that the formation of semiconductor islands is notoriously obvious in the art in order to provide device isolation.

Kuznetsov teaches that metal catalyst induced crystallization occurs by lateral diffusion of the metal throughout the a-Si film. In addition, Kuznetsov teaches a concentration of Ni+ ions to a maximum concentration of about $1.5X10^{20}$ atoms/cm^3. (pg. 191-194) Thus, such diffusion, while not explicitly taught by Oka, is inherent in the process of Oka as a result of the metal induced lateral crystallization. In reference to amended claims 27, 31, 33, 36, 42, 45, and 47, a-Si is then thermally crystallized at 550 C°, where the grain nuclei ordinarily formed in the seed regions and grain growth proceeds from said seed regions parallel to the substrate surface and TFT charge carrier flow (fig. 5-8). TFTs are subsequently formed in the crystal growth region. Oka does not explicitly anticipate leaving areas of the film amorphous.

However, Liu teaches forming regions of a-Si on Corning 7059 glass and some of the regions that were not treated with Ni prior to a low temperature thermal treatment

remain amorphous, while a-Si regions that were treated with Ni are crystallized into polysilicon after said thermal treatment (Example 2). Liu teaches the selective crystallization of certain regions is advantageous because it allows simultaneous formation of driver TFTs that require a low leakage current in the amorphous regions (col. 3, lines 10-17).

Therefore it would have been obvious to one of ordinary skill in the requisite art to leave a second region (disposing nickel in contact with a selected region of only the first region of the semiconductor film) of Oka amorphous by not providing a seed region. One of ordinary skill in the art at the time of the invention would have been motivated by Liu's teachings. That is in order to simultaneously obtain driver TFTs of high mobility in the polysilicon regions and pixel TFTs, which require a low leakage current in the amorphous regions. Therefore, Oka would have been motivated to incorporate these teachings of Liu for there disclosed intended purpose.

Kumomi teaches MILE or catalyst enhanced areas crystal growth takes place parallel to the substrate (e.g. MILC). It is held, absent evidence to the contrary, that crystal growth of Oka would occur by this mechanism, as it is a fundamental characteristic of the process. See In re Best, 195 USPQ 428 (CCPA 1977) and In re Fitzgerald, 205 USPQ 594 (CCPA 1980).

Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP`915), in combination with Liu et al. (US `826) and in combination with Kuznetsov (Inst. Phys. Conf.) and in combination with Kumomi as applied to claims 5-8, 11-12, 16, 19, 27-48 above, and further in view of Yonehara (US `093) and/or Shibata (US `224 or JP `224).

Oka and Liu lack anticipation for irradiating the polysilicon after the thermal crystallization.

Yonehara and/or Shibata teach the irradiating the polysilicon after a thermal crystallization in order to improve the properties of the film, such as mobility. It would have been obvious to one of ordinary skill in the art to irradiate the polysilicon of Oka and Liu after the thermal crystallization in order to improve its mobility as taught by Yonehara and/or Shibata.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP `915) in combination with Liu et al. (US `826) and in combination with Kuznetsov (Inst. Phys. Conf) and in combination with Kumomi as applied to claims 5-8, 11-12, 16, 19, 27-48 above and further in view of Kuznetsov.

Kuznetsov teaches determining Ni concentration in metal induced crystallized silicon using SIMS (sec. 2)

Therefore, it would have been obvious to one of ordinary skill in the requisite art to test the metal induced crystallized silicon of Oka or catalyst containing material of Oka by SIMS to check for the presence of and to determine the distribution of deleterious metal impurities (Oka, pgs. 10-11 of translation) as taught by Kuznetsov.

Response to Arguments

Applicant asserts none of the references teach or suggest the features of amended claims, including forming a first TFT using the first semiconductor island, so that the direction of crystallization proceeding coincides with a carrier flow direction of said first TFT. Applicant further asserts that Oka does not teach arranging the TFT in light of the

relationship between the carrier flow direction and the crystal growth direction. However, Oka discloses that grain growth proceeds from the seed regions parallel to the substrate surface and the TFT carrier flow n Figs. 5-8. It is inherent that, in order to cause grain growth parallel to the substrate surface and TFT carrier charge flow as disclosed by Oka, the TFT is arranged in light of the relationship between the carrier flow direction and the crystal growth direction.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Brairton whose telephone number is (703) 605-4213. The examiner can normally be reached on M-F, 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-4082 for regular communications and (703) 746-4082 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Scott A Brairton
Examiner
Art Unit 2823

sab
July 24, 2002

LONG PHAM
PRIMARY EXAMINER